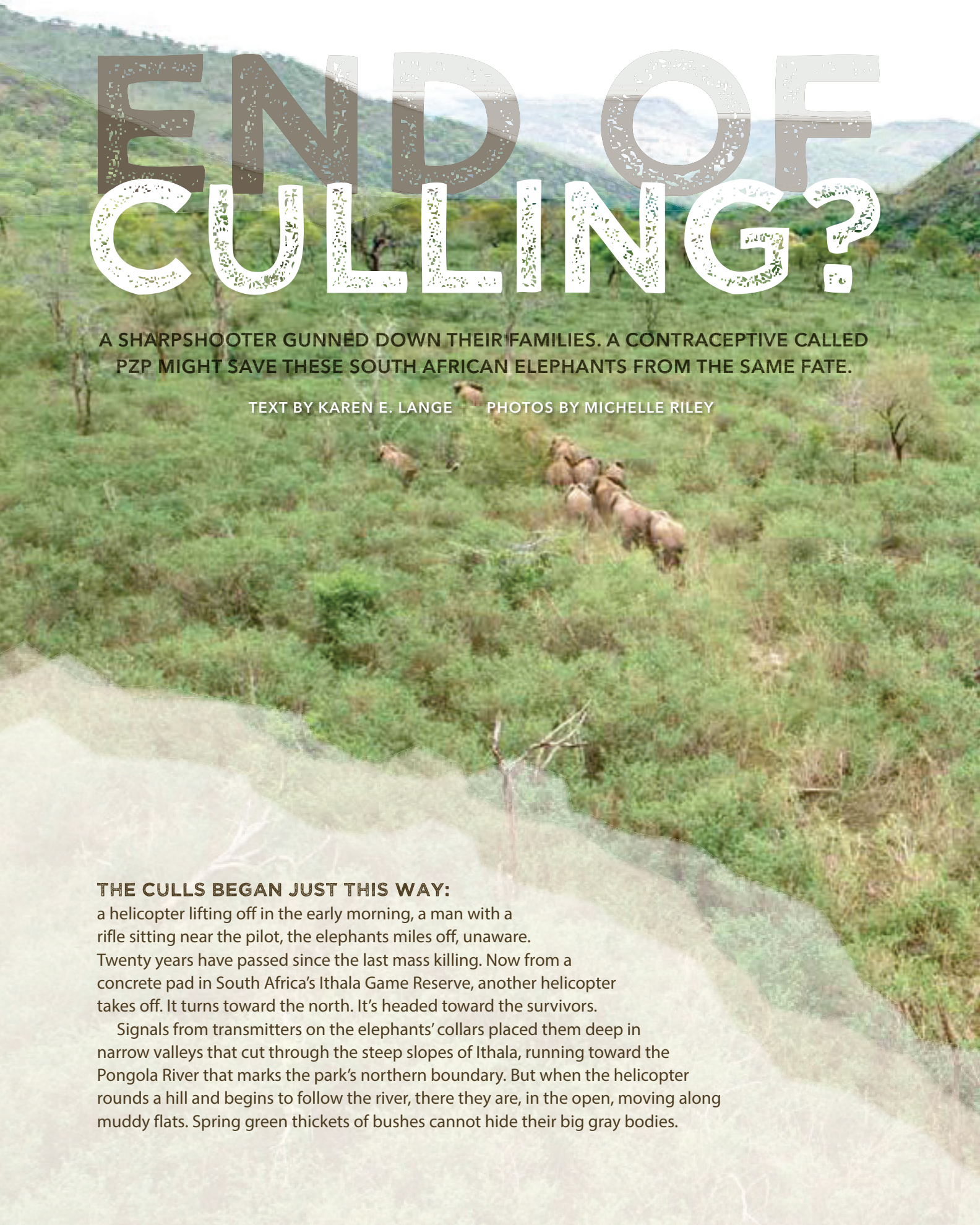
END OF CULLING?

A SHARPSHOOTER GUNNED DOWN THEIR FAMILIES. A CONTRACEPTIVE CALLED PZP MIGHT SAVE THESE SOUTH AFRICAN ELEPHANTS FROM THE SAME FATE.

TEXT BY KAREN E. LANGE PHOTOS BY MICHELLE RILEY



THE CULLS BEGAN JUST THIS WAY: a helicopter lifting off in the early morning, a man with a rifle sitting near the pilot, the elephants miles off, unaware. Twenty years have passed since the last mass killing. Now from a concrete pad in South Africa's Ithala Game Reserve, another helicopter takes off. It turns toward the north. It's headed toward the survivors.

Signals from transmitters on the elephants' collars placed them deep in narrow valleys that cut through the steep slopes of Ithala, running toward the Pongola River that marks the park's northern boundary. But when the helicopter rounds a hill and begins to follow the river, there they are, in the open, moving along muddy flats. Spring green thickets of bushes cannot hide their big gray bodies.

THE NEW FRONTIER

A wildlife contraceptive called PZP is transforming the way humans manage animal populations. In the final story of this three-part series, *All Animals* looks at what this pioneering contraceptive means for African elephants. Previous stories examined the implications for white-tailed deer and wild horses (go to *humanesociety.org/allanimals* to read them).

Early in the morning in Ithala, veterinarian Dave Cooper prepares the PZP vaccine for darts (top left). He has already injected dye into the darts to mark treated animals (bottom left). A helicopter will take him across the park to where elephants roam.

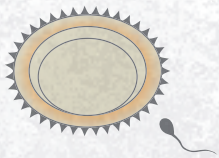
Helped by a spotter who's directing the pilot toward GPS readings from the collars, veterinarian Dave Cooper finds a herd of mothers, calves and older offspring. As a student in the 1970s, Cooper watched the annual culls in Kruger National Park that held the number of elephants there around 7,000. Ordered to spare the youngest elephants, sharpshooters left little bands of orphans, which the government moved to smaller reserves like Ithala, restoring the animals to areas where they had been hunted out.

The survivors charge away from the buzz of the copter, ears pressed to the sides of their heads, backs colored in the mud of the riverbank, where every one of them has rolled, painting the herd terra cotta. Adults and juveniles alike flee, hurtling away from the noise overhead, as the Kruger herds must have done during the culls. But this time, instead of a sharpshooter, Cooper sits by the pilot with the door open. He's holding a rifle that fires darts containing a contraceptive called PZP. Six weeks earlier, the elephants here received their first vaccination. Today, they will be darted with a booster. These two treatments and the annual boosters that will follow will give the elephants a chance to remain relatively undisturbed, their lives unfolding peacefully, their numbers growing, but not so rapidly that they change the habitat in a way that hurts other species.

The helicopter circles and the elephants bunch into a tighter group. Rain is moving in and soon it won't be safe to fly. For now, though, the helicopter moves smoothly down on the elephants, hovering above the tops of the knobthorn trees. Cooper picks out an adult female and fires. The dart hits her backside, delivering the contraceptive and a temporary splotch of green dye that marks the animal as treated, then the dart falls to the ground. Cooper quickly reloads and fires again, darting a second female. Altogether, he repeats the process 61 times from 30 to 60 feet in the air, missing only once, darting 60 cows from several herds—in less than an hour.

Sometimes Cooper wonders whether it would have been better if the 50 orphans brought to Ithala in the early 1990s had not been spared. They have thrived here, multiplying to 154, creating new families to replace the ones that were destroyed. But after the cull, they ceased to be what Cooper calls "normal": Seeing their mothers and aunts and older sisters and brothers gunned down traumatized them. Lacking matriarchs—dominant females who lead groups of cows, calves and younger males—they didn't form regular herds and didn't understand what to do when confronted by threats. Worst of all, growing up without mature bulls to teach them how to behave, the males became unpredictable and dangerous. Like juvenile delinquents run amuck, they picked fights with rhinos, pursuing them and goring them to death. In other parks that received orphan calves, older bulls were brought in from Kruger to physically intimidate the younger males and put a stop to this behavior. At Ithala, because the terrain was too rugged to transport big elephants and the park lacked fencing, this could not happen.

Without PZP, Ithala might be forced to shoot some of its elephants, says Peter Ruinard, Ithala's conservation manager and the chairman of the elephant management committee for Ezembelo KZN (KwaZulu-Natal province wildlife). "We would be under pressure to remove animals," he says, and there wouldn't be anywhere for the extra elephants to go. "If you can't remove animals live, than you



HOW PZP WORKS

Elephant cows injected with the vaccine produce antibodies that block sperm from fertilizing eggs. Under development: vaccine boosters that can be delivered every other year instead of annually.

have to remove them dead."

With PZP, Cooper will each year return to dart Ithala's elephants (until a longer-lasting form of the vaccine is developed for elephants). In three years—the time it would take for any pregnancies to come to term—the park will begin to see the results, which should be a sharp reduction in the number of calves. Longer term, population growth should level off. The orphans need never see another cull.

For centuries, the amount of rain that fell in southern Africa controlled the rate at which elephants reproduced. Now, increasingly, PZP does. Early on, most elephant managers dismissed the contraceptive as unproven and too costly. Fourteen years of research and HSI-funded trials at The Greater Makalali Private Game Reserve (Makalali) changed that. The vaccine is currently being used in 20 protected areas in South Africa, including nine of the 25 with the largest populations of elephants. Three provincial parks and one national park adopted it within the last two years.

"We've gone from basically zero percent recognition to 100 percent recognition," says Teresa Telecky, HSI's director of wildlife, who hopes PZP will eventually be used in all of the protected areas. That includes Kruger National Park, by far the biggest, with the biggest population of elephants—some 17,000 animals in an area nearly the size of New Jersey.

Elsewhere on the continent, the problem is not soaring elephant numbers but diminishing elephant populations. Poaching threatens their very survival, as organized crime networks connected to terrorist and rebel groups kill large numbers (estimated at nearly 100 per day) to supply ivory to Asian markets, especially China. South Africa, for the moment at least, lies beyond the reach of these ivory cartels. If efforts to combat the poaching fail, Ruinard and others believe the country may become a refuge for the last of Africa's elephants. And so wildlife managers in South Africa face a very different challenge than their counterparts to the north: balancing the needs of a rising number of elephants with the needs of other species in the limited areas preserved for animals.

In a perfect world, elephants would roam free, unfenced. In times of drought, when they would have to walk farther to get from water to food, the very youngest and oldest would die of thirst, hunger, heat stress and exhaustion. Fertility rates would drop as the condition of cows declined. Little or no human intervention would be necessary.

But South Africa today is nothing like the place elephants have inhabited for millennia. Europeans' arrival transformed the region as wildlife was hunted out, grasslands and forests were turned into commercial farms, dams were constructed and pumps installed to deliver year-round water, and erosion and mining damaged land. By the beginning of the 20th century, elephants had disappeared from all but the areas now within Kruger and two other parks.

Starting in the 1980s, Kruger repopulated protected areas across the country with elephants, first resettling more than 1,000 orphans from culls and then, after culls stopped, moving elephants to other parks—entire breeding herds of cows and offspring, and also bulls in smaller groups or as individuals. Soon every protected area that could accept elephants had all they wanted. And numbers were increasing fast—even with gestation periods of just under two years, with good conditions populations can double within 15 years.

A southern white rhino grazes along a tourist road in Ithala. To protect this subspecies, classified as "near threatened" because of poaching, and its critically endangered cousin, the black rhino, wildlife managers must make sure the size of the elephant population and its movements do not damage rhino habitat.

Yvonne at Greater Makalali Private Game Reserve enjoys the company of 4-year-old Bean, offspring of a younger female. Researcher Audrey Delsink (opposite, below left) lets cows reproduce once before treating them with PZP.

Fenced in, the South African elephants could not migrate. Provided with unlimited water from man-made water holes, few died, and cows had the highest possible number of calves. Their rapidly rising numbers threatened to overwhelm efforts to recreate long-lost ecosystems.

At Ithala, managers have brought back many of the 25 species of mammals that had gone locally extinct during the 1800s and early 1900s, including giraffes and zebras, buffalo and wildebeests, elephants and rhinos. They are working to repair areas where wastewater from gold mining operations dug miniature canyons. And they are struggling to maintain a fragile balance: In Ithala, Ruinard worries that, above a certain number, elephants could damage grasslands where white rhinos graze and thickets of trees where critically endangered black rhinos feed (Ithala's elephants focus on these trees because sourveld grass species are less palatable and lose their nutritional value in winter).

Rhinos are Ruinard's top priority because they are the rarest of all the animals at Ithala and the creatures most imperiled by poachers—rhino horn is far more valuable than ivory and far more portable. The wave of rhino poaching that has struck many of South Africa's protected areas, killing as many as 1,000 animals each year, has started to reach Ithala.

To protect habitat for the park's remaining rhinos (Ithala also supplies other protected areas with rhinos), Ruinard is trying to give away 30 elephants to quickly reduce the park's elephant population. He's hoping to relocate them to other parks. But over three years he's been unable to find anyone willing to take them.

Ruinard is also hoping to expand the area where Ithala's elephants can safely graze. At the same time, he wants to keep them from getting into conflict with people who live around the park. He hopes to do this by putting up a fence. Already, the elephants are wandering across the Pongola River, with park staff rushing to drive them back using helicopters. If the elephants discover a nearby sugar cane plantation, it will become very difficult to keep them in the park.

Contraception is the third and surest part of Ruinard's plan. As he sits early on the morning of the PZP darting, describing his strategy, it's apparent that he's grateful to have the technology. Nearby, Cooper prepares the darts with dye and vaccine, resting them on a stone ledge surrounding a fire pit, pausing only to look up when a vervet monkey sneaks down a nearby tree and swipes a container of the green liquid. Signals from the collars put the

breeding herds and some groups of bulls in the park's northeast region, far from the roads. One bull is right along the river, as he has been for several days, threatening to leave Ithala and perhaps climb the rocky slope where cattle from neighboring communities sometimes graze.

Ithala's elephant density is more than 40 percent higher than research recommends for this type of habitat; Ruinard says PZP buys people time to deal with the problem. "Things would [be] a heck of a lot more complicated if contraception wasn't there."

Ruinard's plan does not include a cull. But the possibility is there for all South Africa's protected areas. In 2008, the government issued National Norms and Standards for the Management of Elephants in South Africa. These require management plans such as Ruinard's for every protected area. Managers must first use all the nonlethal means at their disposal, including contraception. After that, the rules allow culling: Temporarily banned by a 1994 moratorium, it's now permitted as a last resort.

Those who work with elephants describe them as intelligent, perceptive, empathetic—able to sense when people are at their most vulnerable and to offer, through their presence, movements and gestures something akin to love (though researchers do not use that word). Bigger and far more powerful than human beings, they normally do not harm us, unless they have been attacked or come into conflict with people over food and migration routes. Again and again, they show mercy. Yet in South Africa these creatures could once again be slaughtered in culls.

Northwest of Ithala and close to Kruger lies a protected area created from six private ranches, called Makalali. Wildlife biologist Audrey Delsink arrived here in 1998 and began caring for the reserve's small herd of elephants. As she studied them, she consulted experts at Kruger, leading her to meet U.S. researcher Jay Kirkpatrick and others who had begun treating elephants there with PZP, then a new contraceptive that had worked on horses and deer in the U.S. They were looking for a protected area much smaller than Kruger to continue his research. Makalali, just 90 square miles in size with only 18 cows, sounded perfect. So Delsink and South African researcher J.J. van Altena started treating the Makalali elephants with PZP in 2000.

Fourteen years later, Delsink continues to monitor those 18 cows, plus eight new ones. The Kruger experiments had shown that PZP can prevent cows from becoming pregnant. The published results of Delsink's study, along with work by Kirkpatrick, van Altena and South African vaccine developer Henk Bertschinger, have proven that PZP can slow the growth rate of an entire elephant population.

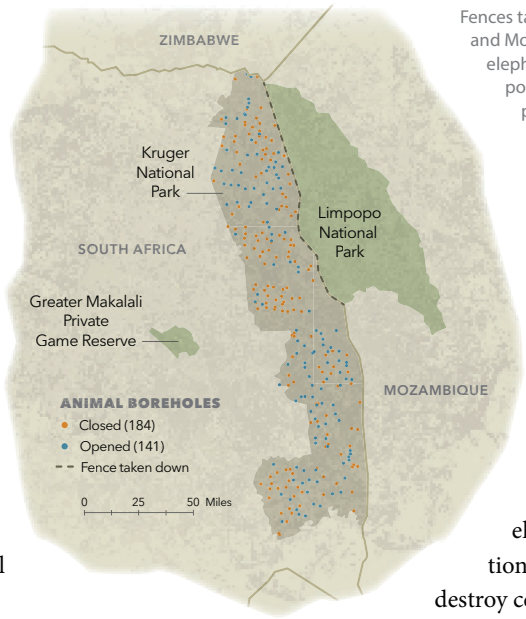
The idea is not to stop reproduction all together. That would result, after many years, in the population's disappearance. It would also disrupt the culture of the herd, because elephants are highly social and all members of breeding herds help look after calves. At Makalali, Delsink allows each cow to have one calf before treating her with PZP. The contraceptive's effect can be quickly reversed: Any year a cow isn't revaccinated, she can become fertile again. Contraception with PZP mimics natural processes such as droughts. It lengthens the time between births of calves and slows population growth. If a cow has a calf once every nine years, say, instead of the average of once every 4.5, four to five fewer elephants will be born to that cow in her lifetime.

In October—early spring in southern Africa—Makalali is more gray than green. Animals blend into thickets of low, thorny trees that border the dirt road. Delsink rides in one of the reserve's viewing trucks, a roofless all-terrain vehicle with a seat extending from the front for a tracker named Pharence Mthimkhulu. Occasionally the driver, head ranger Lawrence Mathonsi, stops so Delsink can hold up an antennae and receiver to get readings from radio transmitters on the elephants' collars. She catches some signals, but they are far off.

The elephants Delsink knows so well are nowhere in sight, although there are piles of manure and uprooted, broken, bark-stripped trees where they've passed. Elephants' destructive feeding habits are necessary for their survival and that of the ecosystem: To get nutrients when it's too early for leaves, elephants tear trees from the ground to eat the roots, exposing them for other animals in the process. To get roughage to aid their weak digestive systems, elephants tear the bark off tree trunks and branches. This works so well that elephant manure often contains whole, undigested fruits, which disperse plant seeds.

Mathonsi drives around the roads in the southern portion of the reserve, hoping all the elephants haven't crossed into a distant section to the north. Mthimkhulu scans the road for tracks. He

spots some, then loses them. Mathonsi turns the vehicle around and drives back slowly, so the tracker can look more closely. Suddenly, with a motion of his hand, Mthimkhulu directs Mathonsi to turn the vehicle sharply off the road and nose his way through narrow spaces between the trees. Branches scrape on metal as the vehicle crashes through the thicket. Ahead in the tangle of gray, the swishing tail of an elephant comes into sight. And then, abruptly, the vehicle emerges into a clearing where a small group of 14 elephants is noisily eating, tearing branches off marula trees. A young bull knocks down one tree and the others pull up the roots with their trunks.



Fences taken down between South Africa's Kruger National Park and Mozambique's Limpopo National Park allow Kruger elephants to migrate in search of food and water, reducing population densities. Armed patrols try to prevent rhino poachers from crossing the border going the other way.

Delsink identifies each of these animals by the patterns on the edges of their ears, using a system created by Kenyan researchers. She can see at once that this is the herd of Yvonne, a matriarch older than 50 who was among the first group of elephants brought to Makalali from Kruger in 1994. Startled by the vehicle, one calf runs over to his mother. Another continues to tussle with a younger bull. The two butt heads playfully, seeing who can drive the other back. A third young male faces off with the vehicle, ears flaring in warning. "It's just showing off, really," Delsink says, unconcerned. Then the herd drifts away into the trees. Within five or 10 minutes, despite their size, they are again hidden from view. PZP has allowed them to fit into this little reserve, bounded on all sides by fences.

Delsink and others who work with elephants think contraception could be used in Kruger, despite its vaster spaces and larger herds. Proponents say that instead of treating thousands of cows, managers could treat select groups of elephants in areas of the park where populations are becoming so dense they threaten to destroy certain types of plants.

"For every female that is contracepted, you're saving the life of a calf [right off]," Delsink says. "If you think of how many babies we've saved from being killed and how many populations we've stopped from doubling …"

But Delsink has not been able to persuade Sam Ferreira, large mammal ecologist at Kruger. Though he's her thesis advisor and sees PZP as effective in small protected areas like Makalali, he doesn't view contraception as necessary or suitable in the big park.

Instead, Ferreira believes Kruger can manage the population by focusing on where elephants range and mimicking the natural processes of drought and migration to keep large numbers of elephants away from the most fragile habitats. The park has already reduced the number of water holes by almost two thirds and taken down fences, most notably along the eastern edge, which borders Mozambique's Limpopo protected area.

Unfortunately, elephants migrate slowly, testing out new stretches of land before moving into them. Few have left Kruger for Mozambique. And because of elephant poaching across the border, some who left have returned (several with wounds from poachers). The border between the two countries has become a zone of heightened security, patrolled by armed Kruger rangers and units of the South African National Defense Force. Late in 2014, Kruger began evacuating rhinos from areas of intense poaching to heavily guarded sections of the park, with a plan to move many out altogether.

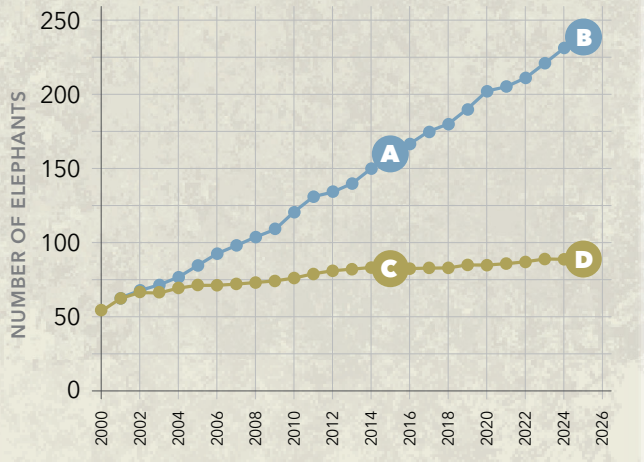
The reduction in water holes has helped reduce the number of calves being born, though, as has the doubling of the park's elephant population, which stresses cows. And more elephants are dying of natural causes. These changes have caused the annual population growth to drop from as high as 8 percent in the 1990s to around 2 percent in 2013, says Ferreira, who anticipates that in the future the average growth rate will fall to nearly zero. "[Kruger] is large enough so that natural mechanisms can play out."

If less water and fewer fences are not enough, Kruger's management plan provides for firing guns at herds to disperse them into other parts of the park, then, if necessary, shooting

PROVEN EFFECTIVE

HSI-funded research at Makalali showed that PZP can slow the growth rate of an entire elephant population. Today elephant numbers are 50 percent lower than they would have been without PZP. By 2025, they are projected to be 60 percent lower.

A: 2015 - 159 **B**: 2025 - 238 **C**: 2015 - 83 **D**: 2025 - 89



The data assumes age of first calving at 10 years, intercalving interval of 4.7 years, age of last calving at 55 years and mortality at 65 years.

An untreated breeding herd in Addo park shows how quickly elephants can reproduce. Elsewhere in Addo, PZP is being used to keep numbers from soaring.

individual elephants and finally, in certain circumstances, killing entire groups. Contraception is not listed as an option.

Hundreds of miles southwest of Kruger lives an unlikely group of indigenous elephants. The animals for which Addo Elephant National Park is named came very close to extinction. Citrus farmers persuaded the government to pay big-game hunters to exterminate animals who raided crops and killed laborers. When Addo was created in 1931, just 11 elephants were left. Confined by an elephant-proof fence erected in the 1950s, the park's elephants became a symbol of the region and the nearby city of Port Elizabeth. Today volunteers patrol the park as honorary rangers, making sure visitors follow rules, checking fences and watching out for poachers after dark.

The park has around 600 elephants in a little over 200 square miles. They spill onto the paved roads, threading their way through lines of tourists' SUVs, and graze on roadside vegetation. Decades distant from a time when humans killed them, they are patient with people. Incidents in which elephants roll or crush vehicles that get too close are unusually rare here.

As elsewhere, elephants are central to the ecosystem at Addo—without them it would not exist— but too many of them will radically change it. The park depends on elephant manure and flightless dung beetles who gather it to fertilize the spekboom plant and other vegetation, says conservation manager John Adendorff. The beetles cannot survive at temperatures above those in the shady microclimates beneath the bushes. Where there are just enough elephants, the bushes flourish, providing sustenance to the elephants and other animals. Where there are too many elephants, they eat down the branches, exposing the cool areas beneath and killing the beetles. The spekboom and smaller plants, unfertilized, also die, leaving bare earth and hungry elephants.

Adendorff grew up in Kruger, the son of a ranger, during the time of the culls. He won't say that the people who carried them out were wrong—they were doing the best they could at the time with what they knew. But he says that he will never cull at Addo. Not after years of working with the species. "You realize there's more to elephants and [that] you have to manage them by any way possible to avoid that."

Like Ruinard, Adendorff has a plan. He is hoping to buy land to continue a series of park expansions that have given the elephants more and more room. Limiting their water is also an option. Already, the park's elephants walk daily from the main gate area, where water and tourists are plentiful, down to the southern end of Addo, where there's less water but more to eat. And Adendorff is treating around 125 elephants in one section of Addo with PZP. If it works, he wants to treat all the park's elephants.

"We've got a tool at our disposal where … you don't have to shoot any elephants," he says. "This is the one population in Africa where you don't have to fear these elephants. Do you want to lose that?"

Time can't go backwards. The elephants at Addo, if they are to survive, must do so in a limited space. They will never again be able to migrate. But Adendoff thinks there's a way to keep them on the land that's left for them without resorting to culling. Like Ruinard, like Cooper, like Delsink, he's betting on PZP.